

Chapter 1 : Working Stress Method

1-1 to 1-21

Syllabus : Concept of reinforced concrete, Working Stress Method (WSM) of design for reinforced concrete, permissible stresses as per IS:456-2000; stress-strain curve of concrete and steel, characteristics of concrete and steel reinforcement. Concept of balanced, under reinforced and over reinforced sections. Analysis and design of singly reinforced and doubly reinforced rectangular beams for flexure.

1.1	Introduction to Various Design Philosophies of RC Structures.....	1-1
1.1.1	Historical Development.....	1-1
1.1.2	Working Stress Method (WSM).....	1-1
1.1.3	Ultimate Load Method (ULM).....	1-2
1.1.4	Limit State Method (LSM).....	1-2
1.2	Working Stress Method.....	1-3
1.2.1	Fundamental Assumptions.....	1-3
1.3	Example of Uncracked Section.....	1-5
1.4	Flexural Behaviour of Reinforced Concrete.....	1-7
1.4.1	Balanced Section.....	1-9
1.4.2	Over-Reinforced Section.....	1-9
1.4.3	Stresses in Singly Reinforced Rectangular Sections.....	1-10
1.4.4	Permissible stresses.....	1-12
1.4.5	Analysis of Doubly Reinforced Sections.....	1-15
1.5	Differentiate between Working Stress Method (WSM) and Limit State Method.....	1-20

Chapter 2 : Limit State Method

2-1 to 2-6

Syllabus : Introductions to limit state method of design as per IS:456-2000. Concepts of probability and reliability, characteristic load, characteristic strength, partial safety factors for loads and materials, introduction to various limit states of collapse and serviceability.

2.1	Limit State Method (LSM).....	2-1
2.1.1	Introduction.....	2-1
2.2.2	Types of Limit States.....	2-1
2.2	Characteristic Strength and Loads.....	2-1
2.3	Partial Safety Factors for Load and Material Strength.....	2-2
2.3.1	Partial Safety Factors for Material Strength.....	2-2
2.3.2	Partial Safety Factors for Loads.....	2-2

2.4	Study of Structural Properties of Concrete	2-3
2.4.1	Assumptions of Limit State Method	2-3
2.5	Design Stress-Strain Curve for Reinforcing Steel	2-4

Chapter 3 : Limit State of Collapse - Flexure, Shear, Bond & Torsion
3-1 to 3-88

Syllabus : Design of singly and doubly reinforced rectangular and flanged sections for flexure, shear and bond. Design of beams subjected to bending, shear and torsion.

3.1	Limit State of Defecation	3-1
3.1.1	Type of Deflection	3-1
3.1.2	Deflection Control in Design (IS 456-2000 Page 37)	3-2
3.2	Limit State of Cracking	3-3
3.2.1	Causes of Cracking	3-3
3.2.2	Effect of Cracking and its Significance.....	3-4
3.2.3	Classification and Types of Cracks.....	3-4
3.2.4	Serviceability Requirement for Cracking	3-4
3.2.5	Crack Control.....	3-4
3.2.6	Shear Reinforcement	3-5
3.3	Reinforcement Requirements	3-7
3.4	Analysis of Singly Reinforced Rectangular Sections	3-7
3.4.1	Problems	3-11
3.5	Analysis of Singly Reinforced Flanged Sections	3-16
3.6	Analysis of Doubly Reinforced Sections	3-20
3.7	Design of Singly Reinforced Rectangular Sections	3-26
3.8	Design of T-Beams	3-32
3.9	Bond	3-34
3.10	Introduction of Torsion	3-35
3.10.1	Primary Torsion.....	3-35
3.10.2	Secondary Torsion	3-35
3.11	Behaviour of RC Rectangular Sections Subjected to Torsion	3-36
3.12	Write a Short Note on Design Strength of Torsion Combined	3-36
3.13	Torsion-Shear Interaction Equation and the Curve	3-37

3.14	Problems Based on Torsional Resistance of Beams	3-38
3.15	Design Problems Based on Sections Subjected to i) Combined Bending and Torsion ii) Combined Shear and Torsion.....	3-39

Chapter 4 : Design of Slabs using LSM
4-1 to 4-54

Syllabus : Design of simply supported one way slabs as per IS : 456-2000. Design of simply supported two way slabs as per IS : 456-2000.

4.1	Design steps of One-Way Slabs.....	4-1
4.2	Design of Continuous One-way Slabs	4-12
4.3	Two-Way Slab.....	4-19
4.3.1	Introduction.....	4-19
4.3.2	Torsion in Two-Way Slabs.....	4-20
4.3.3	Types of Two-Way Slabs	4-21
4.3.4	Analysis of Two-Way Slabs	4-21
4.3.5	Design steps of Two-Way Slab.....	4-23
4.3.6	Problems	4-24
4.4	Difference between One Way Slab and Two Way Slab.....	4-54

Chapter 5 : Limit State of Collapse - Compression
5-1 to 5-15

Syllabus : Limit state of collapse : compression for short and slender column. Introduction to members subjected to combined axial and uni-axial as well as biaxial bending. Development of interactive curves and their use in column design.

5.1	Introduction.....	5-1
5.1.1	Classification of Columns.....	5-1
5.2	Members Subjected to Axial Load and Uniaxial Bending	5-4
5.2.1	A Column subjected to Axial Load and Uniaxial Moment can Fail in any of Three Modes.....	5-4
5.2.2	Procedure for Analysis of Section	5-5
5.3	Development of Interactive Curves and their Use in Column Design	5-5
5.4	Problems based on Design of Axially Loaded Columns.....	5-7

Chapter 6 : Design of Foundations
6-1 to 6-59

Syllabus : Design of isolated square and rectangular footings subjected to axial load and moment. Introduction to basic concepts of combined rectangular pad footing, slab beam type footing and Raft foundation.

6.1	Isolated Square and Rectangular Footings Subjected to Axial Load and Moments.....	6-1
6.2	Problems based on Design of Isolated Footings.....	6-1
6.3	Design of Raft Foundation.....	6-20
6.4	Introduction.....	6-21
6.4.1	Needs of Combined Footing.....	6-21
6.4.2	Rectangular Combined Footing.....	6-21
6.4.3	Design Steps.....	6-22
6.4.4	Problems	6-24
